Kayaking and Canoe Expedition Communications

Communication on Multi-Day River and Coastal Expeditions

A multi-day paddling expedition presents a communications challenge that most other outdoor pursuits do not: the group is spread across a linear corridor with no practical ability to cut across terrain to regroup. On a river, there is no shortcut. If the lead boats are three bends ahead of the sweep boat, those three bends of dense riparian vegetation provide complete visual and acoustic isolation. Even powerful VHF radios struggle in winding river valleys where there is no line of sight between boats.

Meshtastic can help in this environment. Note that 915 MHz is a higher frequency than VHF (30-300 MHz), so it actually attenuates more through riparian vegetation and diffracts less around terrain - it does NOT "propagate better" than VHF on physics alone. LoRa's real advantage is its high spreading factor (processing gain): it decodes weak signals far below the noise floor at very low data rates, holding a link where a VHF voice radio would be unusable. Marine and land VHF also run far higher transmit power than the ~1 W Part 15 cap on 915 MHz. Position sharing allows the lead paddler to see the sweep's last-reported position and gauge how far back the group is spread. These position updates are best-effort and may be stale or missing when no relay is in range, so do not rely on them as the sole safety information for scouting rapids or managing portages - confirm visually or by voice for any safety-critical decision.

Waterproofing LoRa Hardware for Paddling

> **Essential requirement:** All electronics used in kayaking and canoeing must be treated as if they will be submerged. Splashing, rain, capsize, and accidental submersion are not edge

> cases on paddling expeditions - they are routine. Budget accordingly.

Submersible Dry Bags

A submersible dry bag (rated to a submersion depth of 3 m or more) provides the simplest and most reliable waterproofing for any Meshtastic device. (Dry bags are rated by submersion depth, not an IP code; reserve IP67/IP68 ratings for rigid electronics enclosures.) Keep the device in the dry bag inside the cockpit or hull. The bag can be opened briefly to check the screen, then resealed. A window-type dry bag with a clear transparent front allows reading a T-Echo's e-ink display without opening the bag.

Pelican Cases

A Pelican 1010 or 1020 micro case provides IP67 waterproofing with rigid impact protection in its undrilled, factory-sealed state. **Important:** drilling a cable port voids the IP67 rating unless it is sealed with a proper IP67/IP68-rated cable gland (a plain grommet is NOT sufficient and will let water in on immersion). If you add an external antenna, use a rated gland and pressure/leak-test the case before trusting it on the water. For reliable immersion protection, prefer an undrilled case with an internal antenna. Attach the case to a thigh brace or deck rigging with a short tether so it cannot be lost during a capsize.

Fully Sealed Nodes

For fixed relay nodes mounted on the outside of a boat - such as a node on a sea kayak deck or an open canoe thwart - a fully sealed build is required. Using a RAK WisBlock module with a waterproof antenna pig-tail routed through an IP68-rated cable gland into a sealed PVC junction box provides a robust installation. Conformal coat all exposed PCB surfaces before final sealing.

Mesh as a Safety Net Supplementing PLBs

Personal Locator Beacons (PLBs) are one-way distress devices: they transmit a 406 MHz distress signal to the COSPAS-SARSAT satellite network when activated. They do not allow two-way communication, position sharing between group members, or any form of coordination. They are activated only as a last resort and require SAR to respond.

Meshtastic fills the day-to-day communication layer that PLBs do not address (as a best-effort supplement, never a replacement for a PLB or satellite messenger):

- Group position awareness throughout the day (best-effort; positions can be stale or missing).
- Short text messaging between boats without radio protocol.
- Route logging for post-incident reference (only positions that reach a gateway are logged).

Note: Meshtastic has NO built-in automatic man-overboard or "boat stopped moving" alert. There is no motion-cessation feature; any such alerting would require custom scripting or integration and must not be relied upon for safety.

Every paddler on a serious expedition should carry both: a PLB for the ultimate emergency signal, and Meshtastic for day-to-day coordination and situational awareness.

Practical Range in River Valleys

River valleys are mixed RF environments. Straight sections with low vegetation provide good propagation; tight meanders with dense willows and alders attenuate signal significantly. The figures below are approximate field estimates that vary widely with LoRa preset, antenna, and conditions:

- **Straight river section, open banks:** roughly 1.5 - 4 km node-to-node (approximate).
- **Meandering section, dense riparian vegetation:** roughly 300 - 800 m around a single bend (approximate).
- **Relay node on a high bank or river island:** can extend range to roughly 2 - 5 km from the relay point in both directions (approximate).
- **Open coastal paddling (sea kayak):** roughly 3 - 8 km in calm conditions (approximate); range degrades with wet conditions and sea spray near low-mounted antennas.

Planning Relay Node Positions

For long multi-day river expeditions, plan relay node placements at:

- Major river islands that provide elevation above the riverbank.
- High cut banks where the river has eroded a clear elevation advantage.
- Established campsites where a fixed node can be left for the duration of the trip and collected at the takeout.

Hardware Recommendation: T-Echo for Water Use

The LilyGo T-Echo is a strong option for paddling applications:

- **E-ink display:** Readable in direct sunlight on the water, where glare renders conventional LCD/OLED screens unreadable without cupping your hands around them. On the water, you cannot cup your hands around a screen - you need both hands for the paddle.
- **Sealed, compact form factor:** The T-Echo fits easily in a chest pocket of a paddling jacket or inside a deck bag. Its low-profile design does not snag on spray skirts or interfere with paddle strokes.
- **Battery life:** Runtime with continuous GPS varies widely; expect roughly 8-20 h from the internal ~850 mAh cell depending on GPS and broadcast settings (less in cold). Carry a small USB power bank for multi-day trips. Note the cell is internal and USB-C rechargeable - there is no AAA option.

Even with the T-Echo's inherent compactness, always carry it in a waterproof bag or case. The T-Echo is water-resistant but not waterproof to immersion depth; a capsize in class III+ water will exceed its splash rating.

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